

Flash-Type Discrimination

GOES-R₃ GLM Science

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Dr. William Koshak; NASA/MSFC/VP61



National Aeronautics
and Space Administration

Highlights of Progress for GLM-R3 Flash-Type Discrimination Algorithm Development

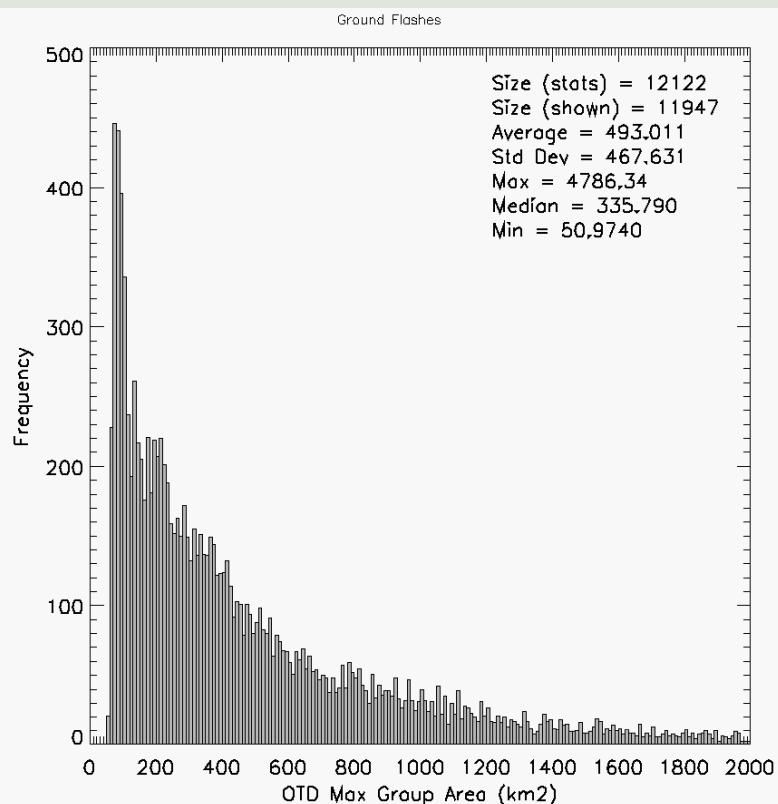
- ✓ Significant progress has been made in defining, testing, and applying a novel method for retrieving the **fraction of ground flashes** in a set of N flashes observed from a satellite-based lightning imager (e.g., GLM, LIS/OTD).
- ✓ Bayesian inversion & a mixed exponential distribution model is what the retrieval method is based on.
- ✓ 3 full-length journal articles have been written (and submitted for review) which discuss the optical data, the retrieval theory, numerical simulations, and the preliminary application results.
- ✓ Maximum Group Area (MGA) data is inverted by the retrieval method. Note that several “optical groups” compose a “flash”, and MGA is a type of “return stroke detector”.
- ✓ Retrieval errors from simulations are very reasonable when $N > 2000$ flashes.
- ✓ Preliminary global-scale retrievals have been completed using 5yr OTD dataset.

3 Completed Journal Papers

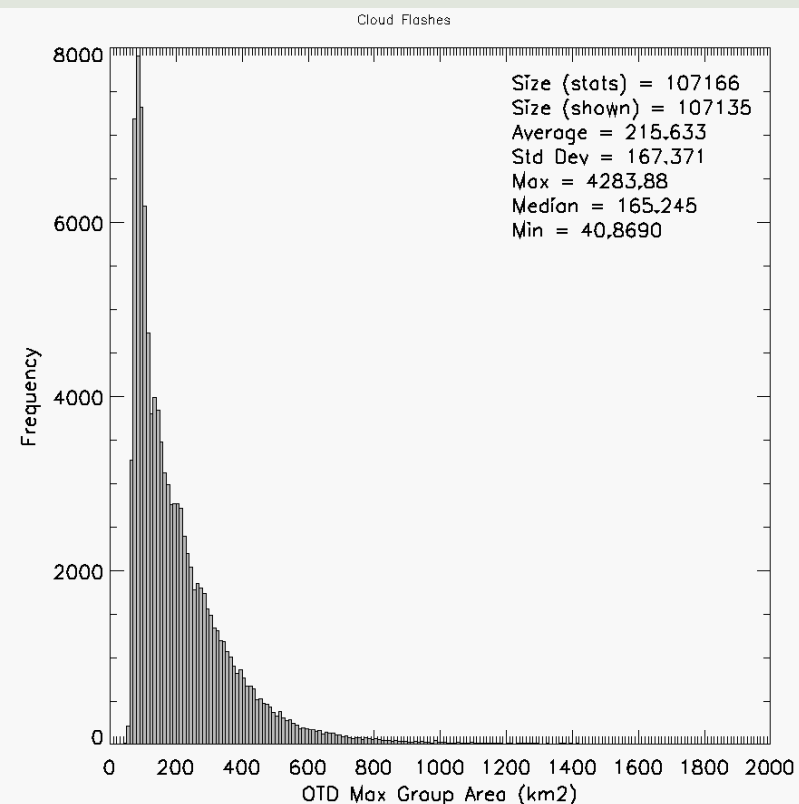
1. Koshak, W. J., Optical Characteristics of OTD Flashes and the Implications for Flash-Type Discrimination, submitted to JTECH, 2009.
2. Koshak, W. J., R. J. Solakiewicz, Retrieving the Fraction of Ground Flashes from Satellite Lightning Imager Data Using CONUS-Based Optical Statistics, submitted to JTECH, 2009.
3. Koshak, W. J., A Mixed Exponential Distribution Model for Retrieving Ground Flash Fraction from Satellite Lightning Imager Data, submitted to JTECH, 2009.

Maximum Group Area (MGA) Data

Ground Flashes:

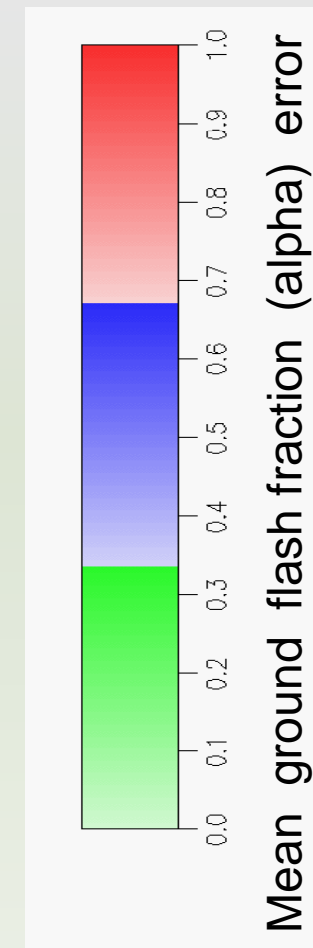
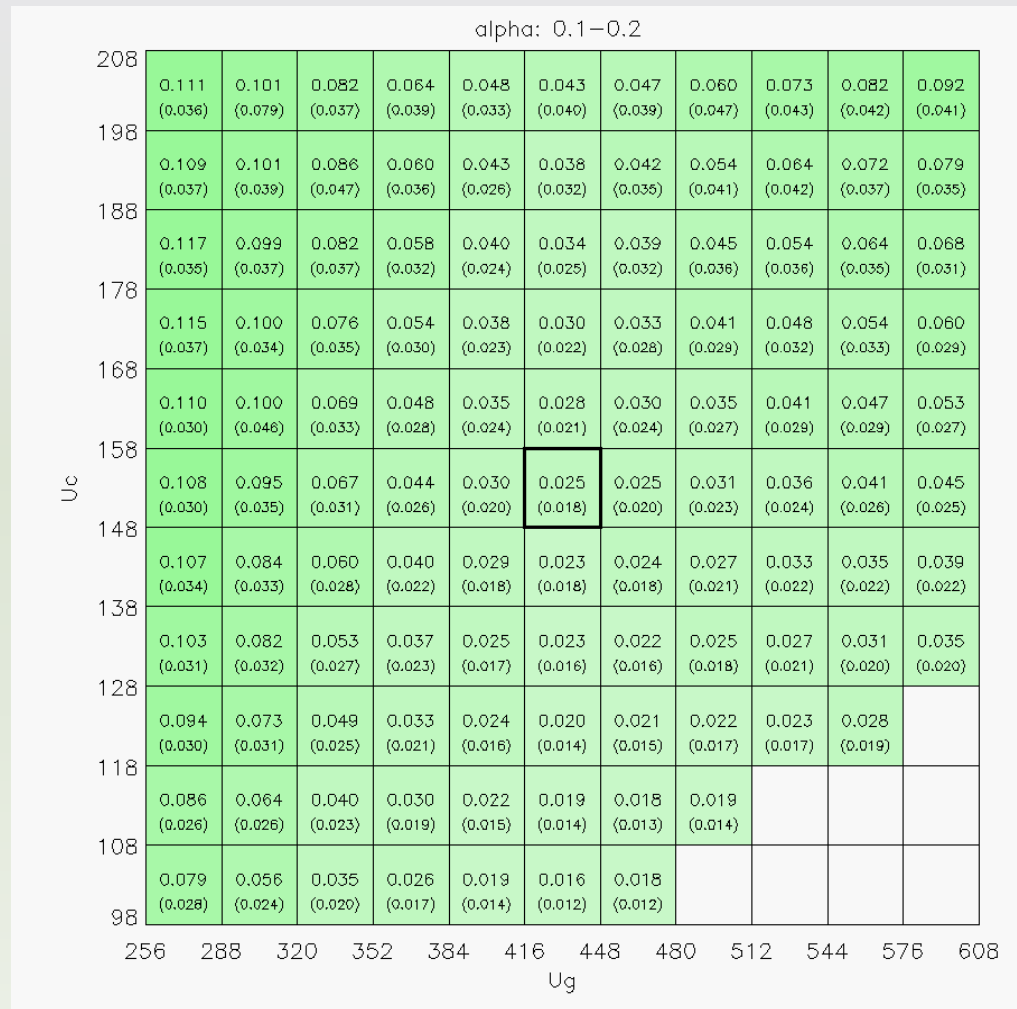


Cloud Flashes:



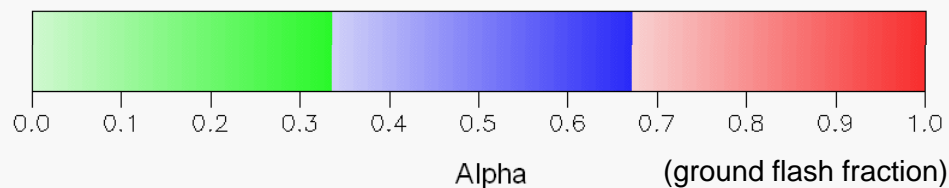
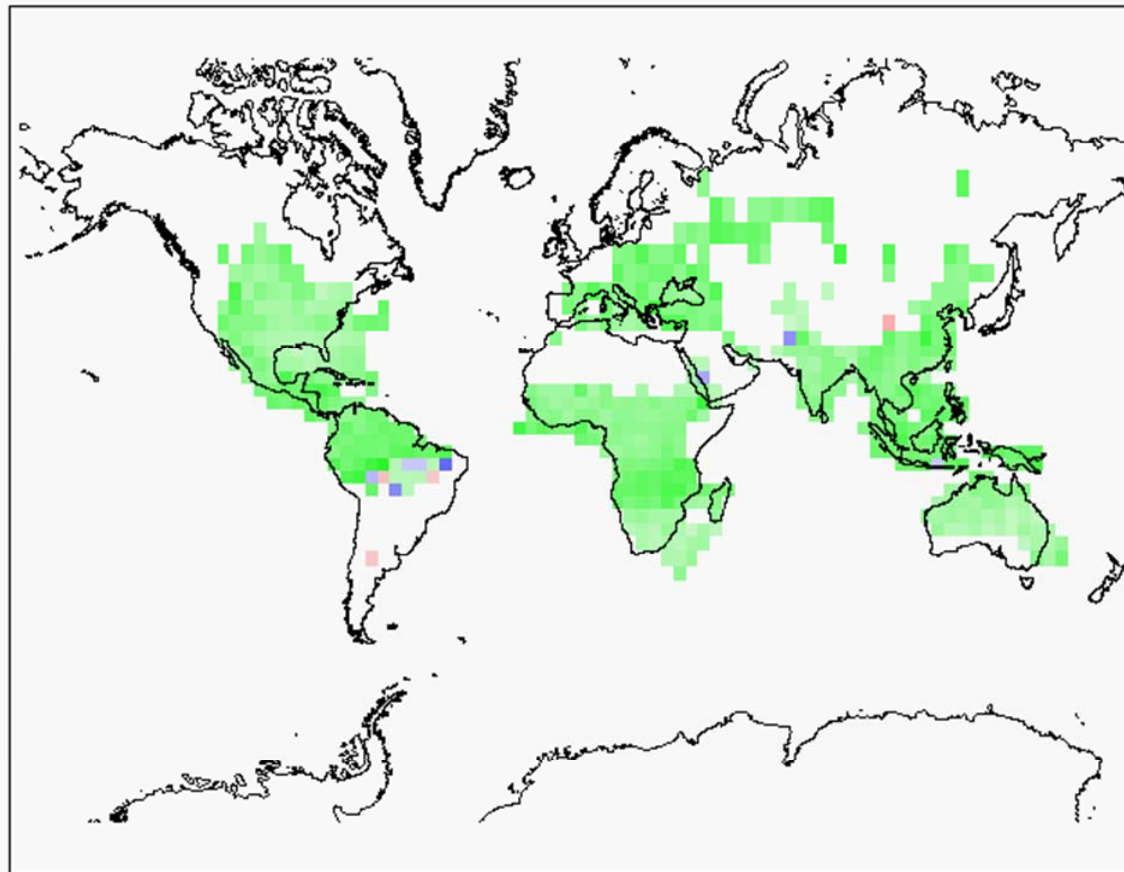
Retrieval Errors from Simulations

[an example of mean (std dev) ground flash fraction error]



Retrieval errors are shown as a function of other modeling parameters (U_g, U_c) in the problem.

Preliminary Global-Scale Retrieval



Based on the 5yr
OTD dataset.

Only lat/lon bins with
2000 or more flashes
were analyzed.

Lat/lon bins are
4 degrees x 4 degrees